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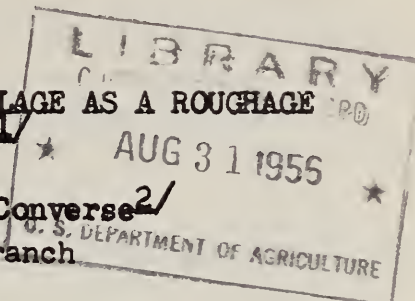
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COMPARISON OF ALFALFA HAY AND WILTED SILAGE AS A ROUGHAGE
FOR GROWING DAIRY HEIFERS^{1/}

by

J. F. Sykes, L. A. Moore and H. T. Converse^{2/}

Dairy Husbandry Research Branch



Previous work at Beltsville had shown that dairy heifers could be satisfactorily raised to 2 years of age with limited milk and grain when hays or hay and corn silage provided the only source of nutrients from 9 to 24 months of age. The present experiment was set up to compare the relative value of alfalfa silage and alfalfa hay for growing dairy heifers in a similar limited milk and grain feeding system. This is of interest because of the present day trend of making a larger portion of the hay crop into silage and because of the smaller acreage of corn now being grown for silage.

Nineteen Holstein and 35 Jersey heifers were assigned to this experiment. They were divided into 3 groups on the basis of the type of forage fed. Group 1 was fed alfalfa hay as the only forage. Group 2 was fed alfalfa silage and limited quantities of alfalfa hay and Group 3 was fed wilted alfalfa silage. The hays and silage fed were of excellent quality. No preservative was added to the silage. The quality of the hays fed was equivalent to U.S. No. 1 or U.S. No. 2 leafy, 45% green alfalfa. Most of the hay was purchased.

All calves were fed colostrum for 3 days after birth and whole milk to 60 days of age according to the following schedule:

<u>Age</u> (days)	<u>Jersey</u> (lbs./day)	<u>Holstein</u> (lbs./day)
0-10	6.0	8.0
10-20	7.0	9.0
20-30	8.0	8.0
30-40	7.0	6.0
40-50	5.0	4.0
50-60	4.0	2.0

1/ Paper presented at the annual meeting of the American Dairy Science Association, Michigan State College, East Lansing, Michigan, June 20-23, 1955.

2/ Retired.

Concentrate was fed according to the following system:

<u>Age</u>	
10-150 days	- Grain feeding increased according to appetite. Maximum of 3.0 lbs. per day allowed.
150-240 days	- 2.0 lbs. per day.
240 days to calving	- No grain fed

Results

Marked differences in growth rate of the heifers on these three rations occurred. These are shown in Figure 1. The heifers which were fed alfalfa hay (Group 1) as the only forage grew at a normal rate as judged by the Ragdale standard. The Holstein heifers actually exceeded this standard slightly and did somewhat better than the Jersey heifers on this ration. All heifers were at least normal weight at 2 years of age.

When alfalfa silage was the only forage fed (Group 3) both the Holstein and Jersey heifers grew more slowly and were much smaller at 2 years of age than the heifers fed alfalfa hay. The difference in body weight at 2 years of age was 91 lbs. for the Jerseys and 240 lbs. for the Holsteins.

When small quantities of hay were fed with the alfalfa silage (Group 2), the growth rate of the heifers was improved as compared to those fed silage only but was still below normal and not equal to the heifers on the all hay ration (Group 1).

The differences in growth rate between these three groups of heifers were most evident between 5 and 12 months of age. The gain in weight from 12 to 24 months of age, however, was very similar for all three groups, as is shown in Table 1. This observation suggests that hay crop silage may be a satisfactory feed for yearling heifers provided they have maintained reasonably normal rates of gain during the first year.

The growth rate of the heifers in these three groups roughly paralleled the feed intake. Detailed records of feed consumption are shown in Tables 2 and 3. The consumption of total digestible nutrients (TDN) per heifer per day is also shown in Figure 2 and 3. Curves representing the National Research Council recommended allowances for normally growing heifers are also shown in these figures. It is obvious from these graphs that the poor growth rates of the heifers which were fed alfalfa silage (Groups 2 and 3) were a result of failure to consume sufficient feed whereas heifers fed hay as the only forage consumed sufficient feed to make normal growth. It is our opinion that the failure of the group 2 and 3 heifers to consume sufficient feed to meet requirements was not so much due to a lack of capacity for silage but was rather due to a lack of appetite for alfalfa silage.

The small quantities of grain which were fed to these heifers undoubtedly accentuated the differences between the hay-fed and silage-fed groups and it is possible that these differences would not show up under conditions where more grain is fed until calving. As will be seen in Tables 2 and 3, the average amount of grain fed to these heifers did not exceed 500 lbs., whereas as much as 2,000 lbs. of grain is commonly fed to heifers under farm conditions before first calving. These experiments show that no more than 500 lbs. of grain is necessary when alfalfa hay is the only roughage fed. This quantity of grain is not sufficient for heifers when alfalfa silage or alfalfa silage and only small amounts of hay are available as roughage.

The minimal amount of grain which must be fed with alfalfa silage to obtain satisfactory growth has not been determined. In this experiment the biggest differences in growth rate appeared after grain feeding was reduced or removed from the ration. After 1 year of age when no grain was fed to any of the heifers, growth of all heifers was about equal. This suggests that, if sufficient grain were fed during the first year along with the alfalfa silage to maintain normal growth, alfalfa silage could be used satisfactorily as the only feed from 12 months of age until calving. About 1,000 lbs. of grain would probably maintain normal growth during the first year when fed with alfalfa silage.

Summary

This experiment has demonstrated that dairy heifers make satisfactory growth in a limited milk and grain feeding system when high quality alfalfa hay is the only forage fed. Milk feeding was discontinued at 60 days of age and no grain was fed from 8 to 24 months of age. The data indicate that no more than 500 lbs. of grain is required from birth to first calving with this type of ration.

Alfalfa silage or alfalfa silage and small quantities of hay is unsatisfactory for growing dairy heifers in this limited milk and grain feeding system, although these data should not be interpreted to mean that alfalfa silage cannot be used for growing heifers under other conditions.

In order to utilize alfalfa silage in rations for dairy heifers it appears that increased amounts of other forages or concentrates than have been used in this experiment must be fed with alfalfa silage. The amounts of these other feeds which must be used have not been determined. There is a suggestion, however, in the present data as well as in the work of others, that alfalfa silage could be used as a sole source of nutrients for heifers over 1 year of age provided that reasonably normal rates of gain were maintained up to 1 year of age.

Table 1 - Average gain in body weight from 12 to 24 months of age.

	Weight at 12 months (lb.)	Weight at 24 months (lb.)	Gain (lb.)
<u>Jersey</u>			
Group 1	417	737	320
Group 2	360	703	343
Group 3	338	646	308
<u>Holstein</u>			
Group 1	670	1151	481
Group 2	554	1039	485
Group 3	486	911	426

Table 2

Feed Consumption - Holstein Heifers

Period ¹	Group 1				Group 2				Group 3			
	: Grain ²	: Alfalfa	: TDN	: Body weight	: Grain	: Alfalfa	: TDN	: Body weight	: Grain	: Alfalfa	: TDN	: Body weight
	(lbs. per day per heifer)	(lbs.)	(lbs. per day per heifer)	(lbs.)	(lbs. per day per heifer)	(lbs.)	(lbs. per day per heifer)	(lbs.)	(lbs. per day per heifer)	(lbs.)	(lbs. per day per heifer)	(lbs.)
1	.23	.07	1.6	108	.2	.07	1.6	103	.3	.07	1.7	107
2	1.6	.6	2.4	144	1.3	.5	2.3	139	1.7	.5	2.1	140
3	2.9	2.3	3.4	192	2.6	1.0	3.3	186	2.9	3.3	2.8	180
4	2.8	4.5	4.5	228	3.0	1.3	4.4	232	3.0	8.1	3.7	213
5	2.6	6.4	5.3	302	2.7	1.2	5.1	282	2.8	11.8	4.7	259
6	1.9	8.3	5.5	350	2.0	1.3	4.5	333	2.1	15.7	4.8	297
7	1.6	10.8	6.8	414	2.0	0.9	6.2	380	2.0	20.0	5.2	336
8	1.6	12.6	7.6	467	2.0	1.1	6.4	420	1.7	24.3	5.7	365
9		14.7	7.7	521		1.3	5.9	454		30.2	5.4	405
10		16.2	8.4	571		1.4	6.4	485		27.6	5.2	427
11		17.5	9.0	610		1.3	6.5	511		31.7	5.0	452
12		18.8	9.7	670		1.3	7.7	554		32.1	6.2	486
13		19.8	10.6	713		1.6	8.2	593		34.3	7.6	516
14		20.6	10.6	760		1.8	8.6	647		36.7	6.8	551
15		20.9	10.8	788		1.9	9.2	692		31.1	6.9	588
16		21.2	10.9	823		2.0	8.5	732		34.9	7.4	622
17		22.5	11.7	858		2.1	8.3	756		39.1	8.2	644
18		23.2	11.9	901		2.2	9.2	782		37.5	8.2	683
19		23.1	11.9	946		2.2	9.0	823		40.0	8.3	728
20		25.5	13.1	993		2.4	10.1	879		43.7	8.3	760
21		26.6	13.7	1034		3.0	10.0	922		45.0	7.9	786
22		27.9	14.3	1069		2.9	9.9	952		43.6	8.6	841
23		27.3	14.1	1103		2.7	10.9	993		42.0	9.5	866
24		27.7	14.7	1151		2.8	10.9	1039		41.2	8.3	911
Total feed consumed per heifer (lbs.)												
0-24	459	12207			476	1232			496			20607

353 to 362 lbs. of whole milk fed per heifer during 1st 60 days of age.

1 30-day periods except 12 and 24 which are 35-day periods.

2 No grain fed after 240 days of age.

Table 3

Feed Consumption - Jersey Heifers

Period	Group 1				Group 2				Group 3			
	: Alfalfa :		: Body :		: Alfalfa :		: Body :		: Alfalfa :		: Body :	
	: Grain 2 :	: hay :	: TDN :	: weight :	: Grain 2 :	: hay :	: TDN :	: weight :	: Grain 2 :	: silage :	: TDN :	: weight :
	(lbs. per day per heifer) (lbs.)				(lbs. per day per heifer) (lbs.)				(lbs. per day per heifer) (lbs.)			
1	.13	.07	1.3	68	.13	.07	.03	1.3	.10	.03	1.3	65
2	.6	.3	1.6	86	.5	.3	.2	1.5	.6	.6	1.5	85
3	1.5	1.0	1.7	107	1.3	.6	.6	1.6	2.0	2.2	1.9	111
4	2.5	2.0	2.9	143	2.3	1.4	1.7	2.8	2.5	5.2	2.8	142
5	2.5	3.5	3.7	181	2.5	1.7	3.7	3.5	2.5	7.7	3.4	177
6	1.8	5.2	4.0	214	2.0	2.1	6.0	3.8	2.0	9.8	3.6	209
7	1.6	6.7	4.7	247	2.0	.6	11.2	4.2	1.9	12.3	4.0	238
8	1.4	7.9	5.1	282	2.0	.7	13.8	4.5	1.7	14.7	4.3	265
9		9.0	4.7	310		.8	17.6	3.9		19.4	3.5	287
10		10.8	5.6	344		.8	20.1	4.3		20.6	3.8	288
11		11.3	5.9	376		.9	21.0	4.5		21.4	3.8	299
12		12.5	6.6	417		1.0	20.9	4.7		20.5	4.6	338
13		13.3	6.9	452		1.1	24.0	5.4		23.7	5.0	361
14		13.7	7.1	480		1.2	25.2	5.8		23.6	4.9	389
15		14.1	7.3	508		1.2	27.3	6.3		24.1	5.4	410
16		14.6	7.6	530		1.2	28.6	6.6		26.9	5.6	433
17		15.4	8.0	551		1.3	29.9	6.8		27.5	5.5	446
18		15.6	8.0	572		1.4	31.9	6.8		28.2	6.1	467
19		15.8	8.1	593		1.5	33.8	6.9		29.2	6.2	502
20		15.7	8.1	614		1.6	32.4	6.8		32.2	6.4	519
21		16.4	8.4	647		1.6	33.3	7.1		33.8	6.5	534
22		17.0	8.8	680		1.7	32.6	6.9		35.6	6.8	569
23		16.7	8.7	704		1.8	32.1	7.3		37.3	7.8	609
24		17.8	9.2	737		1.9	31.8	7.5		37.4	7.5	646
Total feed consumed per heifer (lbs.)					Total feed consumed per heifer (lbs.)				Total feed consumed per heifer (lbs.)			
0-24	356	7844			379	867			400	15103		

360 to 366 lbs. of whole milk fed per heifer during 1st 60 days of age.

1 30-day periods except 12 and 24 which are 35-day periods.

2 No grain fed after 240 days of age.

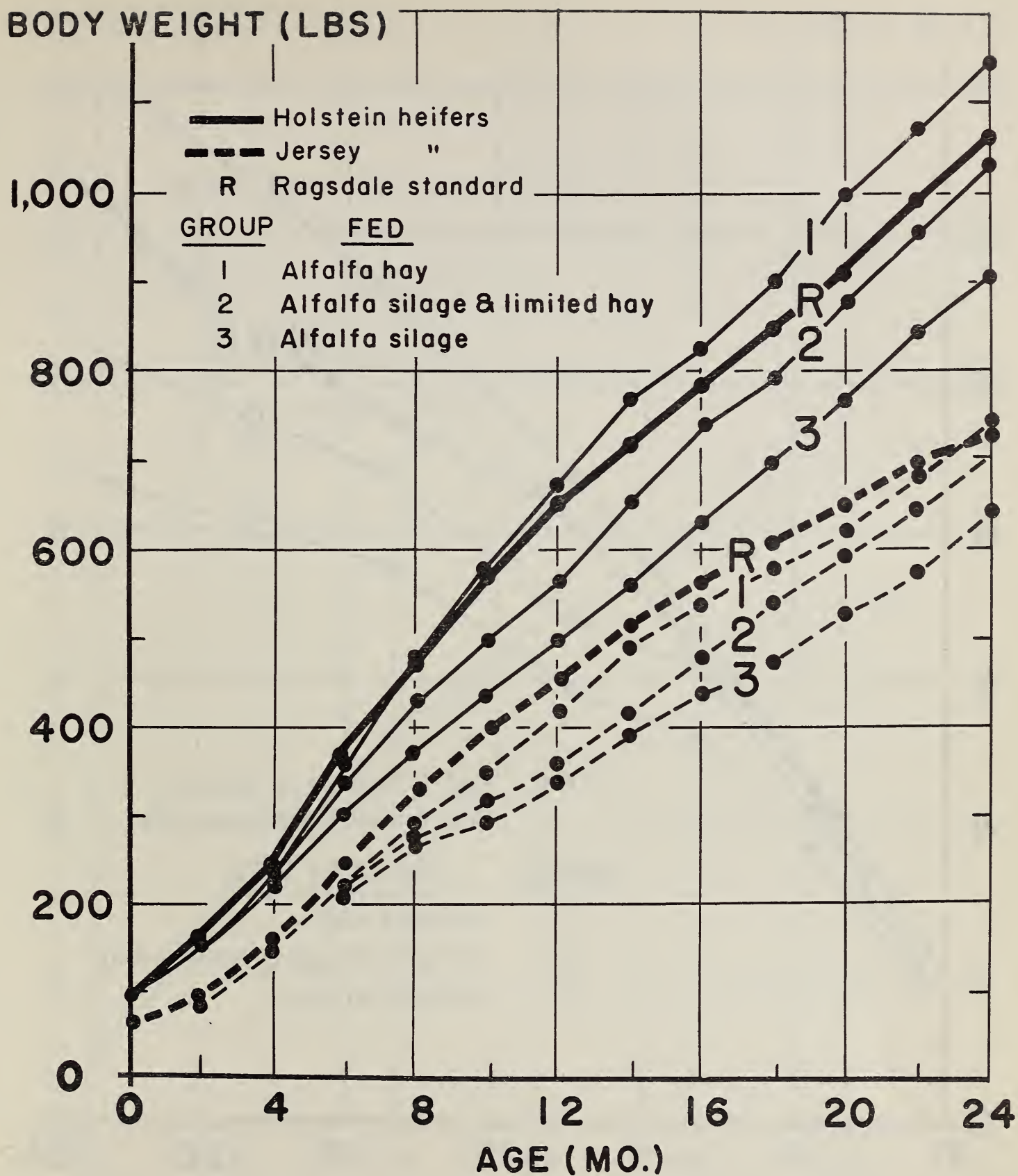


Figure 1. - Growth rates of Holstein and Jersey heifers.

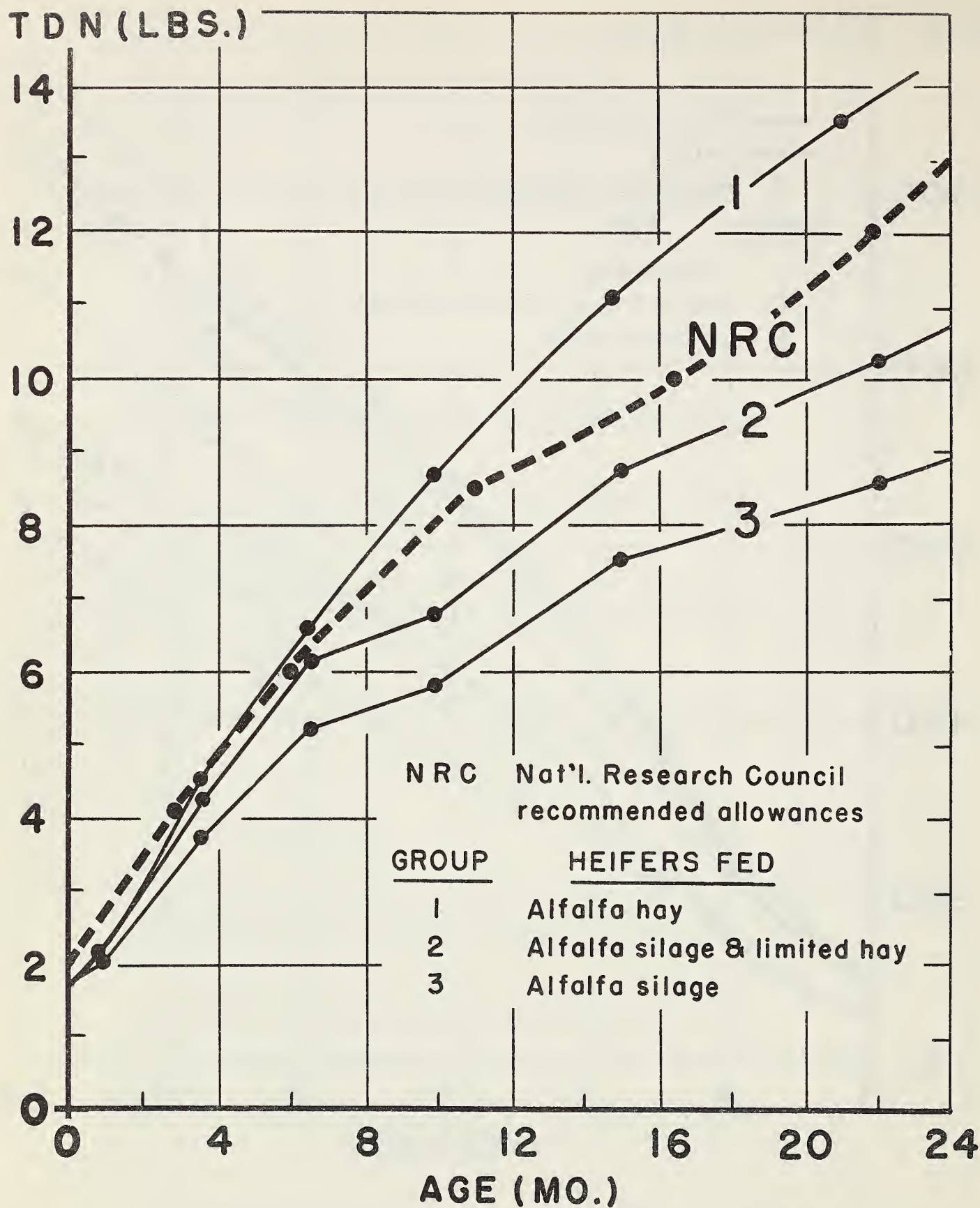


Figure 2. - Average daily consumption of total digestible nutrients by Holstein heifers.

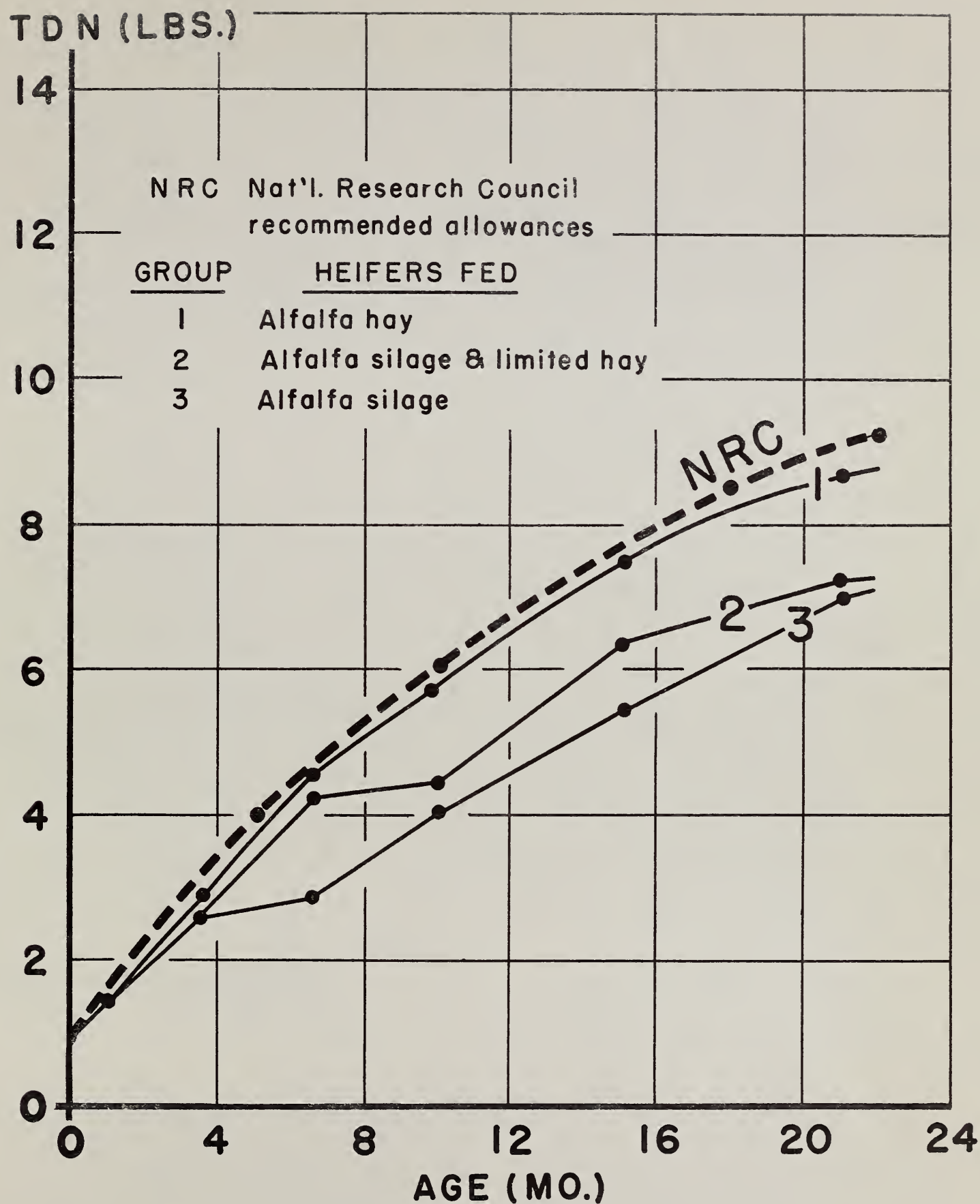


Figure 3. - Average daily consumption of total digestible nutrients by Jersey heifers.

